

Variously substituted metallophthalocyanines as hole transporting materials for perovskite solar cells

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Perovskite solar cells have recently revolutionized the field of the emerging photovoltaic technologies. They have shown an impressive evolution in the last ten years, jumping from an initial 3.8%[1] to a 24.2%[2] certified efficiency but still have drawbacks to overcome, some of which are related to the use of the expensive Spiro-OMeTAD as hole transport material (HTM) and to the perovskite film morphology, whose frequent inhomogeneity results in low-resistance shunting paths and loss of light absorption in the solar cells, seriously undermining their photovoltaic performances. Phthalocyanines are macrocyclic aromatic compounds that can address both the issues: they possess excellent p-type semiconducting properties that make them appealing materials as hole transporters, having already scored efficiencies up to 17.5%[3] and, recently, above 20%[4] in perovskite-based devices. At the same time their hydrophobic aromatic core and their chemical and thermal stability make them potentially effective as active layer sealants, passivating its surface defects and increasing the overall stability of the final devices. In this contribution we will discuss the synthetic approach to electron-rich metallophthalocyanines, including their cost analysis, and some results of their implementation in perovskite-based solar cells.

References:

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